ADEQ Arizona Department of Environmental Quality

RESOURCE SUMMARY

Energy Conservation through Maintenance and Repair

This informal guidance addresses opportunities to conserve energy through maintenance and repair of:

- **Heating, ventilation, and air conditioning (HVAC) systems**
- **Motors**
- **Compressed air**
- **Pumps**
- **Boilers and steam systems**

HVAC

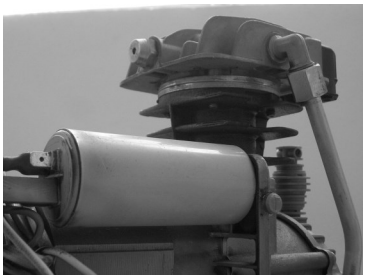
- Replace air filters, clean coils, and check for leaks frequently as part of a regular maintenance plan[1]. Repair leaks with aerosol sealant, not duct tape[2].
- Clear the areas in front of vents for better air distribution in areas where heating or cooling are needed[3]. Close vents or seal off ducts in areas that are not in use[1].
- Adjust thermostat settings based on local time and weather. Set temperatures higher in summer and lower in winter, or turn HVAC off when it is not needed[1].
- Add insulation or use window coverings to minimize heat transfer with the outdoors and lessen heating and air conditioning demand.
- See the *Energy Efficiency in Industrial HVAC Systems*[1] *document* developed by North Carolina.
- For more energy saving tips in HVAC systems, see *An Energy Star® Guide for Identifying Energy Savings in Manufacturing Plants*[2].

Motors

- Use energy-efficient motors and monitor their performance regularly, not just when they are installed or need repairs. Up to 95% of a motor's costs come from energy; only 5% from purchasing, installation and maintenance.
- Check for unusual temperatures or vibration and that the motor is properly vented and lubricated.
- Install adjustable-speed drives in applications with variable motor load. These can reduce wear and prolong motor life, and reduce costs by over 50%.
- Follow the Electric Apparatus Service Association's *Good Practice Guide to Maintain Motor Efficiency*[5] to repair or rewind motors without decreasing efficiency.
- Turn off motors when not in use. To minimize motor stress, consult the National Electrical Manufacturers Association's publication MG 10[6] for acceptable starting frequencies and rest times for various motors.

Compressed Air

- Replace air filters frequently, when the pressure drop exceeds 2-3 pounds per square inch (psi). This prevents air contamination and can reduce energy consumption by 2%[2].
- Inspect and maintain condensate traps regularly. Install pressure-driven valves to remove condensate rather than leaving traps open for constant draining[2].
- Identify leaks by using an ultrasonic acoustic detector or applying soapy water to problem areas, such as hoses, tubes, couplings, fittings, pipe joints, and condensate traps[2].
- Consider alternatives to compressed air, especially for low-pressure applications. Blowers, fans, or other equipment may accomplish the same task at a lower cost[7].
- See the US Department of Energy's (DOEs) website for *Compressed Air Systems*.



This resource summary was created by the Arizona Department of Environmental Quality's Pollution Prevention Program using funds from a P2 Grant provided by the U.S. Environmental Protection Agency.

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Pumps

- Conduct efficiency tests on large or commonly used pumps. Compare the actual efficiency to the design efficiency to determine the potential for energy savings and prioritize maintenance and repairs[8].
- See DOE website for *Pump Systems*[9].
- Regularly inspecting and maintaining pump impellers, bearings, lubrication and seals can reduce energy consumption by up to 7%[2].
- Install control systems or adjustable-speed drives that automatically shut off or reduce pump speed when demand is low[2].
- Identify pumps that are oversized for their application and trim or replace impellers to save energy and reduce costs[9].

Boilers and Steam

- Inspect boilers and steam distribution systems for leaks which can emit air pollutants and impact performance[2].
- Insulate boilers with materials that have lower heat capacity and better insulation, allowing for more rapid heating and less heat lost to the surroundings[2].
- Inspect insulation around boilers and distribution systems for wear, and ensure that it is replaced after any repairs[2].
- Control fouling on the fire side and scaling on the water side of boilers. Buildup can inhibit heat transfer and increase fuel consumption[2].
- Inspect steam traps regularly, or use automated monitors to identify reduce performance. A typical system may have up to 20% of steam traps malfunctioning; repairs can reduce energy use by over 10%[2].

References

[1] NC Division of Pollution Prevention and Environmental Assistance. *Energy Efficiency in Industrial HVAC Systems:* infohouse.p2ric.org/ref/26/25985.pdf

[2] *Managing Your Energy: An ENERGY STAR® Guide for Identifying Energy Savings in Manufacturing Plants:* www.energystar.gov/sites/default/files/buildings/tools/Managing_Your_Energy_Final_LBNL-3714E.pdf

[3] ENERGY STAR®. *Low- and no-cost energy efficiency measures:* www.energystar.gov/buildings/facility-owners-and managers/existing-buildings/save-energy/stamp-out-energy-waste

[4] Motor Decisions Matter. *Motor Planning Kit Version 2.1: Strategies, Tools, and Resources for Developing a Comprehensive Motor Management Pl*an.

[5] Electrical Apparatus Service Association and Association of Electrical and Mechanical Trades. *The Effect of Repair Rewinding on Motor Efficiency: EASA/AEMT Rewind Study and Good Practice Guide to Maintain Motor Efficiency:* www.easa.com/sites/files/resource_library_public/EASA_AEMT_RewindStudy_1203-0115.pdf

[6] US Office of Energy Efficiency & Renewable Energy (EERE). *Motor Systems Tip Sheet #10: Turn Motors Off When not in Use: energy.gov/eere/amo/motor-systems*

[7] EERE. *Compressed Air Tip Sheet #2: Eliminate Inappropriate Uses of Compressed Air:* energy.gov/eere/amo compressed-air-systems

[8] EERE. *Pumping Systems Tip Sheet #4: Test for Pumping System Efficiency:* energy.gov/eere/amo/pump-systems

[9] EERE. *Pumping Systems Tip Sheet #7: Trim or Replace Impellers on Oversized Pumps:* energy.gov/eere/amo/pump-systems

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